

**Amendment Under 37 C.F.R. § 1.111**  
**USSN 09/913,314**  
**Attorney Docket Q65608**  
**April 19, 2005**

**AMENDMENTS TO THE CLAIMS**

**This listing of claims will replace all prior versions and listings of claims in the application:**

**LISTING OF CLAIMS:**

1. (Currently Amended) Process for secondary reforming comprising the steps of:
  - feeding a gas flow comprising oxygen in a combustion chamber through a feeding duct of a burner;
  - feeding a gas flow comprising hydrocarbons in said combustion chamber through a substantially annular passage defined externally to said feeding duct along a predetermined direction;
  - mixing and reacting said gas flow comprising oxygen with said gas flow comprising hydrocarbons inside said combustion chamber, obtaining a gas flow comprising hydrogen and carbon monoxide;
  - feeding said gas flow comprising hydrogen and carbon monoxide to a catalytic bed which ~~lays~~lies below said combustion chamber for carrying out a steam reforming reaction; ~~characterized in that it~~wherein the process comprises the steps of:
    - feeding said gas flow comprising oxygen in said combustion chamber in the form of a plurality of jets generated by corresponding parallel streamtubes having equal velocity, the jets being ~~not laid the one upon the other with respect to said direction of the flow comprising~~  
~~hydrocarbons~~spaced from each other;

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- splitting said plurality of jets within the gas flow comprising hydrocarbons in said combustion chamber;

- mixing in said combustion chamber the gas flow comprising oxygen with amounts of gas flow comprising hydrocarbons at local constant ratio.

2. (Currently Amended) Process according to claim 1, ~~characterized in that~~wherein said gas flow comprising oxygen crosses with substantial transversal motion said gas flow comprising hydrocarbons in said combustion chamber.

3. (Currently Amended) Process according to claim 1, ~~characterized by~~wherein the fact of subjecting said gas flow comprising oxygen flowing along said feeding duct to an overall pressure drop comprised between 0.25 and 2 bar.

4. (Currently Amended) Process according to claim 1, ~~characterized in that~~wherein said jets of the gas flow comprising oxygen are fed into said combustion chamber with a substantially orthogonal motion with respect to the motion of such flow inside said feeding duct.

5. (Currently Amended) Burner for secondary reforming of the type comprising:  
- substantially cylindrical duct (12) of predetermined length for feeding a gas flow comprising oxygen to a combustion chamber (4) beneath the burner;  
~~characterized in that~~it~~wherein~~ the burner further comprises:

- at least one collector (15) for said gas flow comprising oxygen radially protruding from an end (12a) of said duct (12) of the burner and in fluid communication therewith, comprising a plurality of nozzles (16) distributed along a perimeter of said at least one collector (15) near a lower end (15a) thereof and arranged ~~so as not to lay the one upon the other with respect to a~~

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~~direction orthogonal to said lower end (15a) of said at least one collector (15)~~spaced from each other.

6. (Currently Amended) Burner according to claim 5, ~~characterized in that~~wherein said nozzles (16) are arranged in said at least one collector (15) in only one row, ~~preferably parallel to said lower end (15a) of the collector.~~

7. (Currently Amended) Burner according to claim 5, ~~characterized in that~~wherein said nozzles (16) have a diameter comprised between 2 and 30 mm, preferably between 5 and 25 mm.

8. (Currently Amended) Burner according to claim 5, ~~characterized in that~~wherein said nozzles (16) are flared at an inner side (17') of said at least one collector (15).

9. (Currently Amended) Burner according to claim 5, ~~characterized in that~~wherein said lower end (15a) of said at least one collector (15) has a substantially semicircular section.

10. (Currently Amended) Burner according to claim 5, ~~characterized in that~~wherein it comprises a plurality of said collectors (15) that extend radially from said end (12a) of said duct (12), said nozzles (16) being distributed along opposite walls (17) of said collectors (15).

11. (Currently Amended) Burner according to claim 10, ~~characterized in that~~wherein said nozzles (16) are circular and suitably spaced the one from the other, according to the following relationship:

$$Ni*Di^2/(Ri*DR)=C$$

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wherein, C is a constant,  $R_i$  the radius,  $i$ -th circumference passing through the nozzles,  $N_i$  the number of nozzles on the circumference with radius  $R_i$ ,  $D_i$  the diameter of the nozzles on the circumference with radius  $R_i$ , and the radial distance  $DR = (R_{i+1} - R_{i-1})/2$ .

12. (Currently Amended) Burner according to claim 10, ~~characterized in that~~ wherein the opposite walls (17) of said collectors (15) are plane and substantially parallel to each other and extend from said end (12a) of said duct (12) with an angle comprised between 30 and 60° with respect to the axis (A) of the duct (12).

13. (Currently Amended) Burner according to claim 12, ~~characterized in that~~ wherein the lower end (15a) of said collectors (15) is substantially rectilinear and has a tilt angle comprised between 45 and 90° with respect to said axis (A).

14. (Currently Amended) Burner according to claim 12, ~~characterized in that~~ wherein said nozzles (16) have a tilt angle with respect to said walls (17) comprised between 90 and 10°, ~~preferably 45°~~.

15. (Currently Amended) Burner according to claim 10, ~~characterized in that~~ wherein said end (12a) of said duct (12) comprises inside it means (22) for deviating the gas flow comprising hydrocarbons towards said collectors (15).

16. (Currently Amended) Burner according to claim 15, ~~characterized in that~~ wherein said means comprises a deflector (22) of conical shape whose vertex is provided near an upper portion of said end (12a) of the duct (12).

17. (Currently Amended) Apparatus for secondary reforming of the type comprising

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- a substantially cylindrical shell (2) that defines inside it a combustion chamber (4) and wherein a catalytic bed (3) is arranged beneath said combustion chamber (4);

- inlet nozzles (8, 9) for a gas flow comprising hydrocarbons and a gas flow comprising oxygen, respectively, in fluid communication with said combustion chamber (4);

- an outlet nozzle (10) for a flow comprising synthesis gas in fluid communication with said catalytic bed (3);

~~characterized in that it further~~wherein the apparatus comprises a burner of the type defined in ~~one of the preceding claims 5-16~~ which is provided between said inlet nozzles (8, 9) and said combustion chamber (4).